

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

1. (Currently Amended) A furnace for cracking at least two separate and independent hydrocarbon feeds feed to produce olefins, said furnace comprising:
  - (a) at least one fired radiant chamber, wherein said radiant chamber is divided into at least two separate independent radiant zones by a fired radiant chamber dividing means;
  - (b) at least one radiant burner in each said separate independent radiant zone of said fired radiant chamber;
  - (c) a convection chamber in direct communication with each said fired radiant chamber;
  - (d) ~~at least one~~ a separate and independent process coil for each said separate independent radiant zone for cracking each said separate and independent feedstock, wherein each said separate and independent process coil extends through at least a portion of said convection chamber and extends into one of said separate and independent radiant zones for separately and independently cracking said separate and independent feedstocks to olefins before exiting said furnace;
  - (e) a flue for discharging flue gas located at the top of said convection

- (f) a means for independently controlling the radiant burner in each said separate independent radiant zone.
2. (Currently amended) A furnace for cracking at least four separate and independent hydrocarbon feeds ~~hydrocarbon feed~~ to produce olefins, said furnace comprising:
- (a) at least two fired radiant chambers, wherein each said radiant chamber is divided into at least two separate independent radiant zones by a fired radiant chamber dividing means;
  - (b) at least one radiant burner in each of said separate and independent radiant zones of said fired radiant chambers;
  - (c) a convection chamber in direct communication with each said fired radiant chamber;
  - (d) ~~at least one~~ a separate and independent process coil for each said separate independent radiant zone, wherein each said process coil extends through at least a portion of said convection chamber and extends into one of said separate and independent radiant zones for separately and independently cracking said separate and independent feedstock to olefins before exiting said furnace;
  - (e) a flue for discharging flue gas located at the top of each said convection chamber of said furnace; and
  - (f) a means for independently controlling the radiant burner in each said separate independent radiant zone.

3. (Original) A furnace as defined in Claim 1 wherein said fired radiant chamber is divided into two separate independent radiant zones having substantially the same area.
4. (Original) A furnace as defined in Claim 1 wherein said fired radiant chamber is divided into two separate independent radiant zones which have substantially different area.
5. (Original) A furnace as defined in Claim 1 wherein said fired radiant chamber dividing means is a brick wall.
6. (Original) A furnace as defined in Claim 1 wherein said fired radiant chamber dividing means is a curtain of Nextel material.
7. (Original) A furnace as defined in Claim 1 wherein said fired radiant chamber means is a combination of a curtain of Nextel material and ceramic fiber wall.
8. (Previously amended) A furnace as defined in Claim 1 wherein said means for independently controlling the radiant burners in each said separate independent radiant zone comprises a means for controlling the temperature of each said separate independent radiant zone independently.
9. (Currently amended) An improved pyrolysis cracking furnace having a radiant cracking chamber wherein said improvement comprises dividing said radiant cracking chamber into at least two separate and independent radiant cracking zones by providing a dividing wall in said radiant cracking chamber to separate said radiant cracking chamber into at least two separate and independent radiant

cracking zone zones, providing a separate and independent process coil for directing a separate and independent hydrocarbon feedstock through each said separate and independent radiant cracking zone, and separately and independently controlling the temperature in each of said separate and independent radiant cracking zone to crack each said separate and independent hydrocarbon feedstock to olefins.

10. (Original) An improved furnace as defined in Claim 9 wherein said fired radiant chamber dividing means is a brick wall.
11. (Original) A furnace as defined in Claim 9 wherein said fired radiant chamber dividing means is a curtain of Nextel material.
12. (Original) A furnace as defined in Claim 9 wherein said fired radiant chamber dividing means is a combination of a curtain of Nextel material and ceramic fiber wall.

REMARKS/ARGUMENTS

Reconsideration and allowance are respectfully submitted.

Applicants have amended claims 1, 2 and 9. Applicants respectfully submit that the amendments to the claims are fully supported by the originally filed specification and that no new matter has been added.

In the Office Action, the Examiner rejected Claims 1, 3, 5 and 9-10 under 35 U.S.C. 102(b) as being anticipated by Thompson (2,323,498). Applicants respectfully traverse the rejection.

The present invention as amended herein is directed to a furnace for cracking at least two hydrocarbon feedstocks to produce olefins, having at least one fired radiant chamber that is divided into at least two separate independent radiant zones by a dividing means. The furnace comprises multiple radiant chambers that have separate independent radiant zones with independent feed tubes, and wherein each independent radiant zone's temperature can be controlled independently. Moreover, the present claimed invention provides an apparatus for cracking more than one feedstock under different reaction conditions at the same time to produce an entirely different olefin product slate.

Applicants respectfully submit that the applied prior art does not disclose such a novel apparatus. Specifically, the present amended claims are novel and unobvious over Thompson '498 because, *inter alia*, Thompson '498 describes the use of **a single inlet manifold (11) only** connected to U shaped (9) and parallel conduits (10) allowing for **only one** fluid or gas to pass

through the furnace at any given time. Thompson '498 clearly does not disclose a furnace that provides an effective and efficient method for independently cracking more than one feedstock at a time. Instead, the disclosure of Thompson '498 is limited to describing a furnace capable of heating only one fluid or gas in a radiation and/or convection zone.

More specifically, Thompson '498 discloses a furnace that is supplied by only one feedstock. No separate independent feed tubes as clearly called for in the present amended claims are disclosed or suggested in any way. Even if the Examiner's interpretation of Thompson '498 having separate combustion zones with process coils and conduits (*i.e.*, zones 7 and 7', coils 9 and 9', and conduits 10 and 10', respectively) is correct (and Applicants do not concede the point), confirmation that they are supplied by a single feed tube, and feedstock, is made clear in the following description: Fig. 4 which represents a heater similar to those in Figs. 1, 2 and 3, wherein "fluid to be treated is introduced into inlet manifold 20", notably, by **a single feed line** to the manifold (20) that diverts the liquid into various coils and conduit continuously connected (see Fig. 4, and the specification at col. 2, lines 50-53); Fig. 5 showing another form of conduit arrangement, describes "fluid to be treated is introduced to the heater through the inlet header 25", conspicuously, **a single feed line** is directed into the header (25) whereby the liquid is diverted into continuously connected conduits and coils (see Fig. 5 and the specification at col. 2, lines 69-72).

Thus, Thompson teaches a furnace to heat **one fluid** or gas at a time. In particular, Thompson '498 teaches the introduction of one fluid or gas into a singular manifold or header, which is then diverted into a plurality of smaller streams that flow through the side wall tubes (*see* Thompson '498 at col. 3, lines 49-55). However, there is no disclosure to use separate and

independent process coils or feed tubes for each independent fired radiant zone as called for in the present claims.

Furthermore, with regard to Claim 9 (and claims dependent therefrom), Applicants respectfully submit that there is absolutely no disclosure in the Thompson '498 reference that discloses or suggests the claimed features, especially the requirement in claim 9 that calls for improving an existing furnace by "providing a separate and independent process coil for directing a separate and independent hydrocarbon feedstock through each said separate and independent radiant cracking zone, and separately and independently controlling the temperature in each of said separate and independent radiant cracking zone to crack each said separate and independent hydrocarbon feedstock to olefins." There is no disclosure or teaching in Thompson '498 regarding improving an existing furnace in any respect.

Accordingly, Applicants respectfully request that the Examiner withdraw the Section 102 rejection of Claims 1, 3, 5 and 9-10.

In the Office Action, the Examiner rejected Claims 2, 4, 8 and 13 under 35 U.S.C. § 103, as being unpatentable over Thompson '498.

The Examiner contends that although Thompson is silent as to whether there may be more than one radiant chamber, Claim 2 is rendered obvious because the addition of further radiant chambers is merely a duplication of the essential working parts of a device, citing *St. Regis Paper Co. v. Bemis Co.*, 198 USPQ 8. Applicant respectfully disagrees. The embodiment called for in Claim 2 is not the mere duplication of essential working parts of a device. Instead, the provision of a further radiant chamber provides a furnace that significantly improves the

flexibility of a cracking furnace, by enabling the separate and independent cracking of additional feedstocks at different conditions to provide a unique product slate of olefins. Nothing in Thompson '498 suggests or teaches that the addition of another radiant chamber would provide such significant unexpected benefits. Accordingly, it is respectfully requested that the Examiner withdraw the Section 103 rejection of Claims 2, 4, 8 and 13.

In the Office Action, the Examiner rejected Claims 6-7 and 11-12 under 35 U.S.C. § 103(a) as being unpatentable over Thompson '498 in view of Kushch et al. ('001 or '661). Because the Examiner merely relies on the Kushch et al. references to teach the use of Nextel material in furnaces, Applicant respectfully submits that for the reasons presented above, Claims 6-7 and 11-12 are patentable over the applied art.

In the Office Action, the Examiner further provided a "Response to Arguments." Applicants address these responses as follows:

(1) "Applicants argue that the device of Thompson '498 does not provide cracking more than one feed stock at a time and/or cracking at different conditions to provide different product. However, the language of the instant claim does not commensurate in scope with such argument."

REPLY - Applicants have now amended the claims to clearly be commensurate in scope with such an argument. The claims all call for "separate and independent feedstocks" and the "separate and independent cracking" of the "separate and independent feedstocks."



(2) "Applicants argue that the device of Thomson '498 uses a single inlet manifold connected to U shaped and parallel conduits. That may be so, however, the language of the claim does not preclude the use of such.

REPLY - The language of the claims, as amended, now clearly does preclude the use of such an embodiment and requires each of the zone s to have "separate and independent" feedstocks.

(3) "Applicants argue that Thompson '498 does not teach provision of a separate independent process coil. Such contention is not persuasive as Thompson discloses a separate independent process coil 9, 10 for the radiant zone 7 and a separate independent process coil 9, 10 for the radiant zone 7.

REPLY - The process coils 9 and 10 of Thompson are not separate and independent as required by the amended claims, because they are not employed for carrying separate and independent feedstocks.

(4) "Applicants argue that Thompson does not suggest to operate the furnace at different cracking conditions or to employ different feedstocks. Such contention is not persuasive as the language of the claims does not require any conditions or feedstocks."

REPLY Applicants have amended the claims to make such contention persuasive.

Based on the foregoing, Applicants respectfully request allowance of all pending claims. Early and favorable action is earnestly solicited. The Examiner is invited to contact the undersigned to discuss and still outstanding matter.

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696-250

Respectfully submitted,

A handwritten signature in cursive script, appearing to read 'A B C H', likely representing Alan B. Clement.

Alan B. Clement  
Reg. No. 34,563

**MAILING ADDRESS**

HEDMAN & COSTIGAN, P.C.  
1185 Avenue of the Americas  
New York, NY 10036  
(212) 302-8989